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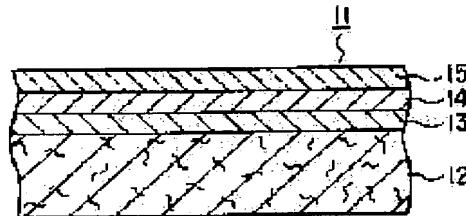
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## (54) REFLECTION CONDUCTIVE SUBSTRATE, REFLECTION LIQUID CRYSTAL DISPLAY DEVICE, AND MANUFACTURE OF REFLECTION CONDUCTIVE SUBSTRATE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To obtain the reflection conductive substrate which is lightweight and has high heat resistance and rigidity by laminating a reflection layer which contains white pigment and resin, a barrier layer formed of silica, and a conductive layer in order on a laminate plate formed of fiber cloth set with resin.

**SOLUTION:** The reflection conductive substrate 11 is constituted by laminating the reflection layer 13 containing the white pigment and resin, the barrier layer 14 formed of silica, and the conductive layer 15 in order on one main surface of the laminate plate 12 formed of the fiber cloth impregnated with thermosetting resin. The silica constituting the barrier layer 14 is produced preferably from polysilazane having a cyclic structure. Further, the reflection layer 13 and barrier layer 14 may be formed on both the surfaces of the laminate plate 12. As the material of the fiber cloth used for the laminate plate 12, there are glass such as E glass, D glass, and S glass and a filament of resin such as aromatic polyamide. The laminate plate 12 is preferably of double stack constitution from the point of view of weight reduction.



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(54)【発明の名稱】 反射型導電性基板、反射型液晶表示装置、及び反射型導電性基板の製造方法

(57)【要約】

【課題】薄型・軽量で、十分な耐衝撃性、耐熱性、耐水蒸気性、及び耐スクラッチ性を有し、構成が簡単であり、耐熱性及び剛性が高い反射型導電性基板、反射型液晶表示装置、及び反射型導電性基板の製造方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、反射型導電性基板、反射型液晶表示装置、及び反射型導電性基板の製造方法に関するものである。

【解決手段】本発明の反射型導電性基板1-1は、樹脂を含浸させて硬化させた繊維布を含む積層板1-2と、白色樹脂とPETとの混合物等からなる光反射層4-4とで構成されている。

【0002】このように、反射型液晶表示装置には、透過程液晶表示装置一様に、反射型導電性基板4-2、4-3と共に、ガラスからなる一对の導電性基板4-2、4-3と、これらより導電性基板4-2、4-3の間に設けられた液晶層4-4と、導電性基板4-2の液晶層とは反対側の面に設けられた、白色樹脂とPETとの混合物等からなる光反射層4-4とで構成されている。

【0003】このように、反射型導電性基板は、一般的には、高光透過率、低ヘリス、及び低リターデーション等の光学的特性を有する厚さ0.7~1.1mmのガラス板上に、透明な導電性材料からなる導電層が形成された透過型導電性基板である。

【0004】図4に、従来の反射型導電性基板の一面断面図を示す。図4で、反射型液晶表示装置4-1は、対向して配置され、それぞれの対向面に電極層が形成され、前記電極層と、ガラスからなる一对の導電性基板4-2、4-3と共に、ガラスからなる導電性基板4-2、4-3の間に設けられた液晶層4-4と、導電性基板4-2の液晶層とは反対側の面に設けられた、白色樹脂とPETとの混合物等からなる光反射層4-4とで構成されている。

【0005】このように、反射型導電性基板には、透過型液晶表示装置一様に、反射型導電性基板4-2、4-3と共に、ガラスからなる一对の導電性基板4-2、4-3と共に、ガラスからなる導電性基板4-2、4-3の間に設けられた液晶層4-4と、導電性基板4-2の液晶層とは反対側の面に設けられた、白色樹脂とPETとの混合物等からなる光反射層4-4とで構成されている。上述の反射型導電性基板は、一般的には、高光透過率、低ヘリス、及び低リターデーション等の光学的特性を有する厚さ0.7~1.1mmのガラス板上に、透明な導電性材料からなる導電層が形成された透過型導電性基板である。

【0006】この透過型導電性基板は、耐熱性及び耐薬品性を有するガラス板を用いているので、例えば、液晶表示装置の製造における配向膜の形成や電極形成等のプロセスで行なわれるオートエクソングラスパッタリング等の処理に対して、十分な強度を有している。

【0007】また、導電性基板に要求される、優れたアダヒテ、水蒸気バリア性、及び耐スクラッチ性等の特性も良好である。しかしながら、上述の透過型導電性基板は、ガラスを用いているため、耐衝撃性が低く、非常に重い。基板を軽量化するために、ガラスの厚さを薄くした場合、耐衝撃性がさらに低下してしまうため、軽量化が困難である。したがって、高い耐衝撃性及び強度であることが求められている小型携帯情報端末機器では、ガラスフィルムを導電性基板に用いること

【0008】図5に、従来の樹脂フィルムを用いた導電性基板の一断面図を示す。図5で、導電性基板5-1は、耐熱性透明樹脂フィルム5-2の一方の主面に、アンカーコード層5-3及び透明電極層5-4が順次重ねられ、耐熱性透明樹脂フィルム5-2の他方の主面に、パリア層5-5及びハードコート層5-6が順次積層されて構成されている。

【0009】樹脂フィルムを用いた導電性基板は、ガラス板とは異なり、割れることなく解体である。しかしながら、一般に、耐熱性バリア性、水蒸気バリア性、及び耐スクラッチ性等の機能の全てを、單一の樹脂層5-1で実現することはできない。そのため、樹脂フィルムを用いた導電性基板5-1では、耐熱性バリア性及び水蒸気バリア性を有するパリア層5-5、及び耐スクラッチ性を有するハードコート層5-6が必要となる。

【0010】また、耐熱性樹脂フィルム5-2には、直角、透明電極層5-4を成形することができない。そのため、耐熱性樹脂フィルム5-2と透明電極層5-4との間に

50 アンカーコート層5-3を設ける必要がある。

【解説手段】本発明の反射型導電性基板1-1は、樹脂を含浸させて硬化させた繊維布を含む積層板1-2と、白色樹脂及び樹脂を含み前記積層板1-2上に形成された反射層1-3と、シリカを含み前記反射層1-3上に形成されたパリア層1-4と、前記パリア層1-4上に形成された導電層1-5とを具備することを特徴とする。



【従来の技術】近年、衛星通信や移動通信技術の進展に伴い、小型携帯情報端末機器の多くに搭載される、導電性基板の多くの要求が高まりつつある。導電性基板の多くは、導電性樹脂や導電性樹脂の複数層構造であることが求められており、液晶表示装置が最も多く用されている。

【0011】また、耐熱性樹脂フィルム5-2には、直角、透明電極層5-4を成形することができない。そのため、耐熱性樹脂フィルム5-2と透明電極層5-4との間に

【0012】また、耐熱性樹脂フィルム5-2には、直角、透明電極層5-4を成形することができない。そのため、耐熱性樹脂フィルム5-2と透明電極層5-4との間に





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温水成形N-L1-1タイプ中に浸漬し、これを80°Cの温度で、30分間熟成した。このポリエーテルスルホンフィルムは、過酸化水素水中に4時間浸漬させた後、さらに、150°Cの温度で、2時間加熱することにより、ポリエーテルスルホンフィルムの両面に厚さが0.5μmのシリカからなるハリア層を形成した。

[00711]さらに、このポリエーテルスルホンフィルムの一方の正面に、スパッタリングにより厚さ1.000オンストロームのITO膜を導電層として形成して、透明樹脂基板(1)を作製した。

[00712]以上のようにして作製した透明樹脂基板(1)の線熱膨張係数を測定したこところ、 $5 \times 10^{-5}$ /℃とやや大きな値であることが分かった。また、表面粗度を測定したこところ、 $R_{max}$ が1.0nmであった。

[00713]・透明樹脂基板(2) (2)の線熱膨張係数を測定したこところ、 $3.5 \times 10^{-5}$ /℃とやや大きな値であることが分かった。また、表面粗度を測定したこところ、 $R_{max}$ が8.0nmであった。

[00714]上記反対型導電性基板(1)～(3)、透明樹脂基板(1)、(2)、及び日本電気硝子から市販されている、厚さ0.7mmの無アルカリガラス基板\*

[表2]

水蒸気透過率 (g/(m <sup>2</sup> day)) (cc/2hr-atm <sup>0.5</sup> )		乾燥透過程率	
反対型導電性基板(1)	0.5	0.1以下	
反対型導電性基板(2)	0.7	0.1以下	
反対型導電性基板(3)	0.7	0.1以下	
透明樹脂基板(1)	2.7	0.1以下	
透明樹脂基板(2)	2.3	0.1以下	
AMOREX	11	0.1以下	
FST-5337	57	1.5	

[00801]表2に示すように、実施例1～3の反射型導電性基板(1)～(3)は、良好な水蒸気パリア性を示していることが分かる。透明樹脂基板(1)、(2)は、反対型導電性基板(1)～(3)に比べると、水蒸気パリア性が低いが、AMOREX及びFST-5337と比較すると、高い水蒸気パリア性を示している。

[00811]また、反対型導電性基板(1)～(3)及び透明樹脂基板(1)、(2)は、十分な酸素パリア性を示していることが分かる。

(実施例4)以下に示すようにして、反射型導電性基板を作製した。

[00821]まず、実施例2で作製した反射型導電性基板(2)の導電層をバーニングして、アレイ電極基板

に、ポリビニルチラールーヨウ漆からなる厚さ0.2mmの陽光フィルムを貼り付けて、5インチの反射型液晶表示装置を作製した。

[00861]なお、反射型液晶表示装置の作製による工程上の反射型導電性基板の反りや焼み等の変形によって、透明樹脂基板及びコモン電極基板を作製したこと以外は、実施例4と同様にして液晶セルを作製した。

[00871] (実施例5) アレイ電極基板を、実施例1～4で作製した反射型導電性基板を用いて形成し、コモン電極基板を、上記透明樹脂基板の表示面側に貼り付けて、5インチの反射型液晶表示装置を作製した。

[00881]なお、反射型液晶表示装置の作製による工程上の反射型導電性基板の反りや焼み等の変形によって、透明樹脂基板は、オA-2基板に対する相対値は、O-A-2基板の重直に対する相対値なる厚さ0.2mmの陽光フィルムを貼り付けて、5インチの反射型液晶表示装置を作製した。

[00891] (実施例6) アレイ電極基板を、実施例3～5で作製した反射型導電性基板を用いて形成したこと以外は、実施例4と同様にして、5インチの反射型液晶表示装置を作製した。

[00901]なお、反射型液晶表示装置の作製による工程上の反射型導電性基板の反りや焼み等の変形によって、透明樹脂基板は、オA-2基板に対する相対値は、O-A-2基板の重直に対する相対値なる厚さ0.2mmの陽光フィルムを貼り付けて、5インチの反射型液晶表示装置を作製した。

[00911] (実施例7) サイズを7インチとしたこと以外は、実施例4と同様にして、反射型液晶表示装置を作製した。

[00921]なお、サイズを7インチにしても、反射型液晶表示装置の作製による工程上の反射型導電性基板の反りや焼み等の変形による工程上のトラブルは生じなかった。また、この反射型液晶表示装置は、1.5mの高さから落下げても、破損が生じなかった。

[00931] (実施例8) サイズを7インチとしたこと以外は、実施例5と同様にして、反射型液晶表示装置を作製した。

[00941]なお、サイズを7インチにしても、反射型液晶表示装置の作製による工程上の反射型導電性基板の反りや焼み等の変形による工程上のトラブルは生じなかった。また、この反射型液晶表示装置は、1.5mの高さから落下げても、破損が生じなかった。

[00951] (実施例9) サイズを7インチとしたこと以外は、実施例6と同様にして、反射型液晶表示装置を作製した。

[00961]なお、サイズを7インチにしても、反射型液晶表示装置の作製による工程上のトラブルは生じなかった。また、この反射型液晶表示装置は、1.5mの高さから落下げても、破損が生じなかった。

[00971] (実施例10) サイズを7インチとしたこと以外は、実施例7と同様にして、反射型液晶表示装置を作製した。

[00981] (実施例11) サイズを7インチとしたこと以外は、実施例8と同様にして、反射型液晶表示装置を作製した。

[00991] (実施例12) サイズを7インチとしたこと以外は、実施例9と同様にして、反射型液晶表示装置を作製した。

[01001] (実施例13) サイズを7インチとしたこと以外は、実施例10と同様にして、反射型液晶表示装置を作製した。

[01011] (実施例14) サイズを7インチとしたこと以外は、実施例11と同様にして、反射型液晶表示装置を作製した。

[01021] (実施例15) サイズを7インチとしたこと以外は、実施例12と同様にして、反射型液晶表示装置を作製した。

[01031] (実施例16) サイズを7インチとしたこと以外は、実施例13と同様にして、反射型液晶表示装置を作製した。



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CLAIMS

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[Claim(s)]

[Claim 1] The reflective mold conductivity substrate characterized by providing the laminate containing the fiber cloth which resin was infiltrated and was stiffened, the reflecting layer formed on said laminate including white pigments and resin, the barrier layer formed on said reflecting layer including the silica, and the conductive layer formed on said barrier layer.

[Claim 2] The reflective mold conductivity substrate according to claim 1 characterized by generating the silica which constitutes said barrier layer from the polysilazane which has cyclic structure.

[Claim 3] The reflective mold conductivity substrate according to claim 1 or 2 with which said reflecting layer and a barrier layer are characterized by being formed in both sides of said laminate.

[Claim 4] The laminate containing the fiber cloth which resin was infiltrated and was stiffened, and the reflecting layer formed on said laminate including white pigments and resin, The reflective mold conductivity substrate equipped with the barrier layer formed on said reflecting layer including the silica, and the conductive layer formed on said barrier layer, The reflective mold liquid crystal display characterized by providing the liquid crystal layer prepared between the transparency resin substrate with which it countered with the field in which the conductive layer of said reflective mold conductivity substrate was formed, and was prepared, and the transparent electrode was formed in the opposed face, and said reflective mold conductivity substrate and a transparency resin substrate.

[Claim 5] The manufacture approach of the reflective mold conductivity substrate characterized by to provide the process which forms the barrier layer which contains a silica the process which applies and heats the mixture of white pigments and thermosetting resin, and forms a reflecting layer in one principal plane of the laminate which the fiber

cloth was made into the core material, and resin was infiltrated, and was stiffened, and by applying and heat-treating the polysilazane which has cyclic structure on said reflecting layer, and the process which form a conductive layer on said barrier layer.

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the manufacture approach of a reflective mold conductivity substrate, a reflective mold liquid crystal display, and a reflective mold conductivity substrate, and relates to the manufacture approach of the reflective mold conductivity substrate suitable for the liquid crystal display especially carried in a Personal Digital Assistant device, a reflective mold liquid crystal display, and a reflective mold conductivity substrate.

[0002]

[Description of the Prior Art] In recent years, the need of a small Personal Digital Assistant device is increasing with progress of satellite communication or migration communication technology. The display carried in many of Personal Digital Assistant devices is asked for it being a thin shape, and the liquid crystal display is most used abundantly.

[0003] Moreover, since it is required for the display for Personal Digital Assistant devices that it is a low power and that the visibility under outdoor daylight should be high, the reflective mold liquid crystal display is used abundantly rather than the transparency mold liquid crystal display.

[0004] One sectional view of the conventional reflective mold liquid crystal display is shown in drawing 4 . The liquid crystal layer 44 prepared between the conductive substrates 42 and 43 of a pair with which the reflective mold liquid crystal display 41 has been arranged face to face, and the electrode layer was formed in each opposed face by drawing 4 , and which consist of glass, and the conductive substrates 42 and 43 of these pairs, and the liquid crystal layer of the conductive substrate 42 consist of light reflex layers 45 which consist of mixture of the white pigments and PET which were prepared in the field of the opposite side etc.

[0005] Thus, the light reflex layer 45 is formed instead of the back light generally used for a reflective mold liquid crystal display with a transparency mold liquid crystal display. The conductive substrate used with an above-mentioned reflective mold liquid crystal display is a transparency mold conductivity substrate with which the conductive layer which consists of a transparent conductive ingredient was generally formed on the glass plate with a thickness of 0.7-1.1mm which has optical properties, such as the Takamitsu transmission, low Hayes, and a low retardation.

[0006] Since the glass plate which has thermal resistance and chemical resistance is used for this transparency mold conductivity substrate, it has sufficient reinforcement, for example to processing of the photo etching performed in processes in manufacture of a liquid crystal display, such as formation of the orientation film, and electrode formation, sputtering, etc.

[0007] Moreover, properties, such as oxygen barrier property required of a conductive substrate, steam barrier property, and scratch-proof nature, are also good. However, since glass is used for the above-mentioned transparency mold conductivity substrate, its shock resistance is low and is very heavy. Since shock resistance falls further when thickness of a glass plate is made thin, in order to lightweight-ize a substrate, lightweight-izing is difficult. Therefore, using resin films, such as plastics, for a conductive substrate is examined by the small Personal Digital Assistant device currently asked for high shock resistance and a lightweight thing.

[0008] One sectional view of the conductive substrate which used the conventional resin film for drawing 5 is shown. The laminating of the anchor coat layer 53 and the transparent electrode layer 54 is carried out to one principal plane of the heat-resistant transparency resin film 52 one by one, the laminating of the barrier layer 55 and the rebound ace court layer 56 is carried out one by one, and the conductive

substrate 51 is constituted from drawing 5 by the principal plane of another side of the heat-resistant transparency resin film 52.

[0009] The conductive substrate using a resin film is lightweight, without being divided unlike a glass plate. However, single resin cannot be made to pay all the functions, such as oxygen barrier property, steam barrier property, and scratch-proof nature, generally. Therefore, in the conductive substrate 51 using a resin film, the barrier layer 55 which has oxygen barrier property and steam barrier property, and the rebound ace court layer 56 which has scratch-proof nature are needed.

[0010] Moreover, on the heat-resistant-resin film 52, the transparent electrode layer 54 cannot be formed directly. Therefore, it is necessary to form the anchor coat layer 53 between the heat-resistant-resin film 52 and the transparent electrode layer 54.

[0011] In addition, although the barrier layer 55 is the monolayer which has oxygen barrier property and steam barrier property, since it is very difficult to give oxygen barrier property and steam barrier property to single resin, the barrier layer 55 is usually constituted from drawing 5 by the two-layer structure which carried out the laminating of the layer which has oxygen barrier property, and the layer which has steam barrier property. However, generally, the resin which has steam barrier property has high surface energy, and its familiarity by other resin is low.

Therefore, in order to paste up other resin on the resin which has steam barrier property, it is necessary to perform surface treatment.

[0012] Thus, in manufacture of the conductive substrate using a resin film, since it is necessary to carry out the laminating of a huge number of the resin layers and many processes are needed, the problem that a production process becomes complicated will be produced.

[0013] Moreover, a line coefficient of thermal expansion is large, since the conductive substrate using a resin film is formed by carrying out the laminating of two or more resin layers from which coefficient of thermal expansion differs, it is easy to produce the curvature of a substrate etc. in the case of a heating process, and thermal resistance, such as heat dimensional stability, is low [ a substrate ]. Furthermore, since this conductive substrate is deficient in rigidity, deformation of substrates, such as above-mentioned curvature and bending, produces it easily.

[0014] Therefore, if both conductive substrates 62 and 63 of a pair are constituted from resin as shown in drawing 6 , the problem that the alignment of a substrate etc. becomes difficult will be produced in the case of manufacture of a liquid crystal display. Since a hotter process becomes \*\* when forming an array electrode, this problem becomes

remarkable especially.

[0015] Moreover, if one conductive substrate 72 is constituted from glass among the conductive substrates 72 and 73 of a pair and the conductive substrate 73 of another side is constituted from resin as shown in drawing 7 , problems, such as alignment of an above-mentioned substrate, will not be produced. However, since glass is used, the problem that shock resistance is low and lightweight-ization becomes difficult is produced.

[0016]

[Problem(s) to be Solved by the Invention] As mentioned above, the configuration became complicated and the conductive substrate used with the conventional reflective mold liquid crystal display needed many processes for manufacture of a substrate, in order to obtain lightweight-izing and sufficient shock resistance, the oxygen barrier property, steam barrier property, and scratch-proof nature of a substrate. Moreover, since thermal resistance and rigidity were low, it was easy to produce deformation of curvature, bending, etc., and manufacture of a display etc. was difficult.

[0017] It is lightweight and has sufficient shock resistance, oxygen barrier property, steam barrier property, and scratch-proof nature, and a configuration is easy and this invention aims at a thin shape and offering the manufacture approach of a reflective mold conductivity substrate with high thermal resistance and rigidity, a reflective mold liquid crystal display, and a reflective mold conductivity substrate.

[0018]

[Means for Solving the Problem] This invention offers the reflective mold conductivity substrate characterized by providing the laminate containing the fiber cloth which resin was infiltrated and was stiffened, the reflecting layer formed on said laminate including white pigments and resin, the barrier layer formed on said reflecting layer including the silica, and the conductive layer formed on said barrier layer.

[0019] This invention is characterized by generating the silica which constitutes said barrier layer from the polysilazane which has cyclic structure in the above-mentioned reflective mold conductivity substrate. This invention is characterized by forming said reflecting layer and a barrier layer in both sides of said laminate in the above-mentioned reflective mold conductivity substrate.

[0020] Moreover, the laminate with which this invention contains the fiber cloth which infiltrated resin and stiffened it, The reflecting layer formed on said laminate including white pigments and resin, and the barrier layer formed on said reflecting layer including the silica,

The reflective mold conductivity substrate equipped with the conductive layer formed on said barrier layer, The reflective mold liquid crystal display characterized by providing the liquid crystal layer prepared between the transparency resin substrate with which it countered with the field in which the conductive layer of said reflective mold conductivity substrate was formed, and was prepared, and the transparent electrode was formed in the opposed face, and said reflective mold conductivity substrate and a transparency resin substrate is offered.

[0021] Furthermore, the process which applies and heats the mixture of white pigments and thermosetting resin, and forms a reflecting layer in one principal plane of the laminate which this invention made the fiber cloth the core material, and resin was infiltrated, and was stiffened, The manufacture approach of the reflective mold conductivity substrate characterized by providing the process which forms the barrier layer containing a silica, and the process which forms a conductive layer on said barrier layer is offered by applying and heat-treating the polysilazane which has cyclic structure on said reflecting layer.

[0022]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained more to a detail, referring to a drawing. One sectional view of the reflective mold conductivity substrate applied to 1 operation gestalt of this invention at drawing 1 is shown.

[0023] The reflective mold conductivity substrate 11 carries out the laminating of the reflecting layer 13 which contains white pigments and resin in one principal plane of the laminate 12 which consists of a fiber cloth into which thermosetting resin was infiltrated, the barrier layer 14 which consists of a silica, and the conductive layer 15 one by one, and consists of drawing 1 .

[0024] Although the laminate used with the reflective mold conductivity substrate of this invention consists of a fiber cloth into which thermosetting resin was infiltrated, it can mention filaments, such as glass, such as E glass, D glass, and S glass, and resin, such as aromatic polyamide, as an ingredient of the fiber cloth used.

[0025] As for the path of this filament, it is desirable that it is 20 micrometers or less. using the filament of a diameter 20 micrometers or less -- a reflective mold conductivity substrate -- thin-shape-izing -- and it can lightweight-ize and the mechanical strength of a substrate can be raised.

[0026] although it can also use as a nonwoven fabric, without weaving when using these filaments as a fiber cloth -- a plain weave and Chu-tzu -- it is desirable to weave by weave, such as textile and twill, and to

use as textile fabrics. Moreover, as for the thickness of a fiber cloth, it is desirable that it is 30-100 micrometers, and it is more desirable that it is 30-50 micrometers. the case where the thickness of a fiber cloth is in above-mentioned within the limits -- a reflective mold conductivity substrate -- thin-shape-izing -- and it can lightweight-ize and the mechanical strength of a substrate can be raised.

[0027] In addition, the surface roughness of the fiber cloth produced changes according to the weave of a filament. the case where a fiber cloth is produced using the same filament -- surface roughness -- twill and Chu-tzu -- although it becomes high in order of textile and a plain weave, a substrate front face can be graduated by forming a barrier layer by sufficient thickness.

[0028] Moreover, when producing a fiber cloth with a plain weave, sinking in to the fiber cloth of the below-mentioned resin becomes easy, and the manufacturing cost of a laminate can be reduced. Thermosetting resin sinks into the fiber cloth explained above. As resin used for sinking in to a fiber cloth, the heat-resistant high thermosetting resin of phenol resin-epoxy resin mixture, bismaleimide-triazine resin mixture, etc. can be mentioned. If the epoxy resin of a bisphenol mold is used as an epoxy resin, using phenol novolak resin as phenol resin, since high thermal resistance can be obtained, it is especially desirable.

[0029] Although what is guided from diamino diphenylmethane can be used as bismaleimide, that to which the phenyl group of diamino diphenylmethane is guided from the compound permuted by the alkyl group may be used. Moreover, triazine resin can be obtained by the demineralization acid reaction of bisphenol A and a cyanogen chloride. In addition, what is marketed from the Mitsubishi engineering plastics company as such bismaleido triazine resin mixture as BT resin by which the epoxy resin etc. was added can be used.

[0030] As the laminate used with the reflective mold conductivity substrate of this invention is shown below, it is manufactured. First, an above-mentioned thermosetting resin constituent is melted to organic solvents, such as ketone solvent, and the above-mentioned fiber cloth is infiltrated. This is dried primarily, and prepreg is produced and formed into B stage. It is 20-60kg/cm<sup>2</sup>, heating this prepreg at about 150-180 degrees C using for example, a two-sheet pile and a hotpress. It pressurizes by the pressure of extent. Furthermore, a laminate is obtained by heating this at about 150-180 degrees C, and stiffening thermosetting resin. As for the rate of the resinous principle in a laminate, it is desirable to be controlled to 40 - 60% of the weight.

[0031] Although the laminate manufactured as mentioned above is the

configuration of having piled up two fiber cloths, it is a light weight and a thin shape, and if sufficient mechanical strength can be obtained, there will be especially no limit in the number of laminatings. However, in order to control the anisotropy of a laminate, as for a laminate, it is desirable to consider as the configuration which piled up even fiber cloths, and it is most desirable to consider as the configuration repeated two sheets from a viewpoint of lightweight-izing.

[0032] As for the thickness of this laminate, it is desirable that it is 50-200 micrometers, and it is more desirable that it is 50-100 micrometers. the case where the thickness of a laminate is in above-mentioned within the limits -- a reflective mold conductivity substrate -- thin-shape-izing -- and it can lightweight-ize and the mechanical strength of a substrate can be raised.

[0033] Moreover, the laminate which is marketed from the laminate manufacturer and with which the metallic foil was stretched on the front face may be used as a laminate used with the reflective mold conductivity substrate of this invention. In addition, the metallic foil stretched by such laminate marketed is easily removable by etching.

[0034] With the reflective mold conductivity substrate of this invention, white pigments like a titania generally used can be mentioned as white pigments used for a reflecting layer. A reflecting layer is formed by making the thermosetting silicone resin distributed in the BTX solvent distribute these white pigments, applying and drying and heating this further to a laminate.

[0035] At this time, as for the weight ratio (P/R ratio) of white pigments to silicone resin, it is desirable that it is 2.5-6, and it is more desirable that it is 4-6. When a P/R ratio is more than the above-mentioned lower limit, the line coefficient of thermal expansion of each class which constitutes a reflective mold conductivity substrate can be made low, and the heat dimensional stability of a substrate can be raised. However, if a P/R ratio exceeds the above-mentioned upper limit, distribution of white pigments will become difficult.

[0036] As for the thickness of this reflecting layer, it is desirable that it is 5-10 micrometers. Without making the thickness and weight of a reflective mold conductivity substrate increase greatly, when the thickness of a reflecting layer is within the limits of this, it can be white, and the color of a laminate can be concealed, and until can reduce surface roughness to some extent.

[0037] The barrier layer of the reflective mold conductivity substrate of this invention can consist of silicas. As for the silica which constitutes this barrier layer, obtaining from polysilazane is desirable.

Polysilazane is general formula H<sub>3</sub> Si(NHSiH<sub>2</sub>)<sub>n</sub> NHSiH<sub>3</sub>. The silazane and general formula n (SiH<sub>2</sub> NH) of the shape of a shown straight chain It is the polymer which makes a frame the shown cyclo silazane. If these polysilazane is carried out hydrolysis and a polycondensation by predetermined processing, Si-N association of polysilazane will be severed, Si-O association will be produced, and a silica and ammonia will be produced. Therefore, when it has the hydrogen atom which polysilazane combines with a silicon atom, the hydrogen atom combined with a silicon atom remains also in the silica to generate.

[0038] If the polysilazane of the low-temperature baking mold which has cyclic structures, such as annular par hydronalium polysilazane by which Pd complexes, such as TONEN polysilazane low-temperature baking mold N-L110 type marketed from TONEN CORP., were added as a catalyst as polysilazane, is used, since polysilazane is changeable into a silica by heating at the comparatively low temperature of about 100-150 degrees C, it is desirable.

[0039] If the polysilazane which has condensed-ring structure is used as polysilazane of the low-temperature baking mold which has cyclic structure especially, the rate of the hydrogen atom combined with a silicon atom decreases in the silica which is a resultant, and since the number of the oxygen atoms combined with the silicon atom whose number is one increases, a firm and precise barrier layer can be formed.

[0040] Formation of the barrier layer using above-mentioned polysilazane can be performed by [ as being the following ]. First, it applies and dries on the reflecting layer formed on the laminate, and the xylene solution of polysilazane is made immersed into hydrogen peroxide solution for about 2 to 4 hours. Next, the barrier layer which consists of silicas is formed by pulling up a laminate from hydrogen peroxide solution, and heating it at the temperature of about 100-150 degrees C for 1 to 48 hours.

[0041] Generally the layer which consists of a silica can also be formed with vacuum deposition or a sol-gel method. However, in vacuum deposition, even if it is difficult to form the film of sufficient thickness, it compares and forms, a crack and a pinhole will be generated. Moreover, in a sol-gel method, in order to change an alkoxide to an oxide, heating at very high temperature is needed. Therefore, it is inapplicable to the substrate using resin.

[0042] If above-mentioned polysilazane is used to it, it is about 100-150 degrees C in comparatively low temperature, and the silica film of sufficient thickness can be obtained. Thus, as for the thickness of the barrier layer formed, it is desirable that it is 0.5-2 micrometers, and

it is more desirable that it is 1.5-2 micrometers. Sufficient oxygen barrier property and steam barrier property can be obtained without making the thickness and weight of a reflective mold conductivity substrate increase greatly, when the thickness of a barrier layer is in above-mentioned within the limits. Moreover, in an above-mentioned reflecting layer, although surface roughness cannot fully be reduced, when the thickness of a barrier layer is more than the above-mentioned lower limit, it becomes possible to fully reduce the surface roughness of a substrate.

[0043] As an ingredient used for a conductive layer with the reflective mold conductivity substrate of this invention, it is In<sub>2</sub>O<sub>3</sub>-SnO<sub>2</sub>. Transparent conductive ingredients, such as mixture (ITO), TiO<sub>2</sub> / Ag/TiO<sub>2</sub>, BiO<sub>3</sub>, SnO<sub>2</sub> (F), CdSnO<sub>3</sub>, and V<sub>2</sub>O<sub>5</sub>, nH<sub>2</sub>O, can be mentioned. As for the thickness of this conductive layer, it is desirable to be formed by the thickness of 500-3000A.

[0044] As for the reflective mold conductivity substrate of this invention, the reflecting layer and the barrier layer may be formed in both sides of a laminate. One sectional view of the reflective mold conductivity substrate applied to other operation gestalten of this invention at drawing 2 R>2 is shown.

[0045] The laminating of a reflecting layer 23, the barrier layer 24, and the conductive layer 25 is carried out to one principal plane of a laminate 22 one by one, to the principal plane of another side, the laminating of a reflecting layer 26 and the barrier layer 27 is carried out one by one, and the reflective mold conductivity substrate 21 is constituted from drawing 2 .

[0046] Thus, if a reflective mold conductivity substrate is constituted so that it may become the symmetry to a laminate, the coefficient of thermal expansion in two principal planes of a laminate becomes equal, and even when heated, it will be hard to produce deformation of curvature etc.

[0047] One sectional view of the reflective mold liquid crystal display possessing the reflective mold conductivity substrate mentioned above to drawing 3 is shown. The reflective mold liquid crystal display 31 counters with the field in which the conductive layer (not shown) of the reflective mold conductivity substrate 32 and this reflective mold conductivity substrate 32 was formed by drawing 3 , is formed, and consists of liquid crystal layers 34 prepared between the transparency resin substrate 33 with which the transparent electrode (not shown) was formed in the opposed face, and the reflective mold conductivity substrate 32 and the transparency resin substrate 33.

[0048] Thus, the usual transparency resin substrate used from the former as shown in drawing 5 as a transparency resin substrate 33 used with the reflective mold liquid crystal display constituted can be used. As mentioned above, the laminating of an anchor coat layer and the transparent electrode layer is carried out to one principal plane of a heat-resistant transparency resin film one by one, the laminating of a barrier layer and the rebound ace court layer is carried out one by one, and this transparency resin substrate is constituted by the principal plane of another side of a heat-resistant transparency resin film.

[0049] As an ingredient of the heat-resistant transparency resin film used for this transparency resin substrate, a polycarbonate, polyarylate and polyether sulphone, the norbornene system resin marketed as ARTON from Japan Synthetic Rubber Co., Ltd., the heat-curing mold arylation polyphenylene ether marketed as A-PPE from Asahi Chemical Co., Ltd. can be mentioned.

[0050] Moreover, although oxygen barrier property and steam barrier property are required also of the barrier layer used for this transparency resin substrate, generally the resin which has these functions in coincidence is not known except the resin containing a halogen atom. However, when the resin containing a halogen atom is used, isolation halogen ion will mix into a liquid crystal layer, and it will have a bad influence on the property of equipment. Therefore, it constitutes from bipolar membrane which usually piled up the resin film which has oxygen barrier property for a barrier layer, and the resin film which has steam barrier property.

[0051] As resin which has the oxygen barrier property which constitutes this transparency resin substrate, nylon, an ethylene-vinylalcohol copolymer, etc. can be mentioned and polyethylene etc. can be mentioned as resin which has steam barrier property. As for these resin film, it is desirable that it is the thickness of 5-10 micrometers. If thickness exceeds 10 micrometers, the light transmittance of a transparency resin substrate falls, and barrier property will become inadequate when thickness is less than 5 micrometers.

[0052] If the rebound ace court layer used with this transparency resin substrate is constituted from urethane resin, silicone resin, acrylic resin, etc., sufficient scratch-proof nature can be obtained. Moreover, an anchor coat layer usually consists of primers, coupling agents, etc., such as acrylic resin.

[0053] In addition, it is desirable to use that in which the barrier layer which consists of silica same with having explained the reflective mold conductivity substrate to one [ at least ] principal plane of an

above-mentioned heat-resistant transparency resin film as a transparency resin substrate was formed. Thus, if a transparency resin substrate is constituted, high barrier property can be obtained with an easy configuration, and a reflective mold liquid crystal display can be lightweight[ a thin shape and ]-ized more.

[0054] As for the thickness of this barrier layer, it is desirable that it is 0.3-2.0 micrometers, and it is more desirable that it is 0.3-1.0 micrometers. Moreover, when this barrier layer is formed in both sides of a heat-resistant transparency resin film, barrier property becomes still higher and is desirable.

[0055] It consists of liquid crystal ingredients same with a liquid crystal layer being used with the usual reflective mold liquid crystal display with the reflective mold liquid crystal display of this invention. As mentioned above, although the reflective mold conductivity substrate of this invention was explained as what is used for a reflective mold liquid crystal display, it is possible to apply to the display using electroluminescence etc. for example.

[0056]

[Example] Hereafter, the example of this invention is explained.

(Example 1) As it was shown below, the reflective mold conductivity substrate (1) was produced.

[0057] First, etching processing was performed to glass epoxy copper clad laminate TLC551M whose width of face is 1m by 0.1mm in thickness marketed from Toshiba Chemical CORP., copper foil was exfoliated, and the laminate which consists of E glass was produced.

[0058] Heat-resistant white coating No. 4264-2 of 1 acidity or alkalinity by OKITSUMO Co. which made silicone resin distribute a titania were infiltrated into this laminate, and the white coating was made it with \*\* to both sides of a laminate. By heating this at the temperature of 150 degrees C for 4 hours, the coating was stiffened and the reflecting layer whose thickness is 5 micrometers in the center section of a laminate was formed in both sides of a laminate.

[0059] Next, this laminate was immersed during the xylene solution which contains the low-temperature baking mold annular par hydronalium polysilazane by TONEN CORP. by 20% of the weight of concentration, and the TONEN polysilazane low-temperature baking mold N-L110 type, and this was dried for 30 minutes at the temperature of 80 degrees C. The barrier layer which thickness becomes from the silica which is 1.7 micrometers in the center section of a laminate was formed on the reflecting layer formed in both sides of a laminate by heating it at the temperature of 150 degrees C further for 2 hours, after making this laminate immersed

into hydrogen peroxide solution for 4 hours.

[0060] In addition, since the dip painting cloth method was adopted in above-mentioned spreading, the thickness nonuniformity of the spreading film had arisen at the edge of a laminate. Then, the edge which becomes an oil level and parallel at the time of immersion was cut and removed by width of face of 10cm, respectively, and the edge which becomes an oil level and a perpendicular was cut and removed by width of face of 5cm, respectively.

[0061] Furthermore, the reflective mold conductivity substrate (1) was obtained by forming the ITO film with a thickness of 1000A in one principal plane of this laminate as a conductive layer by sputtering. In addition, the curvature of a substrate, bending, etc. were not produced at all on the occasion of production of a reflective mold conductivity substrate (1).

[0062] When the line coefficient of thermal expansion of the reflective mold conductivity substrate (1) produced as mentioned above was measured, it turned out that they are  $1.4 \times 10^{-5}/\text{degree C}$  and a very small value.

Moreover, it is  $R_{max}$  when surface roughness was measured. It was 11nm.

[0063] (Example 2) As it was shown below, the reflective mold conductivity substrate (2) was produced. First, etching processing was performed to copper clad laminate CCL-H860 whose width of face is 1m by 0.1mm in thickness marketed from the Mitsubishi engineering plastics company, copper foil was exfoliated, and the laminate which consists of E glass was produced.

[0064] The reflective mold conductivity substrate (2) was produced like the example 1 except having used this laminate. In addition, the curvature of a substrate, bending, etc. were not produced at all on the occasion of production of a reflective mold conductivity substrate (2).

[0065] When the line coefficient of thermal expansion of the reflective mold conductivity substrate (2) produced as mentioned above was measured, it turned out that they are  $1.3 \times 10^{-5}/\text{degree C}$  and a very small value.

Moreover, it is  $R_{max}$  when surface roughness was measured. It was 9nm.

[0066] (Example 3) As it was shown below, the reflective mold conductivity substrate (3) was produced. First, the thermosetting resin constituent which consists of ketone solvent which mixed phenol novolak resin and the epoxy resin of a bisphenol female mold by the weight ratio of 104:168 on the plain-weave fiber cloth T-740 with a thickness of 0.1mm it is thin from E. I. du Pont de Nemours and the Polly p-phenylene phthalamide fiber by the Toray Industries Kevlar company marketed from the SAKAI industrial company, and added latency strengthening catalyst Novacure 3721 by Asahi Chemical Co., Ltd. at 1.5% of the weight of a

rate on it was infiltrated. This fiber cloth was dried at 80 degrees C for 1 hour, and two preprints were produced.

[0067] The laminating of the prepreg of these two sheets is carried out so that MD or the direction of TD of each fiber cloth may cross mutually, and it is 40kg/cm<sup>2</sup>. The hotpress was performed at a pressure and the temperature of 150 degrees C, and the laminate was produced. In addition, the rate of the resinous principle in the produced laminate was 45 % of the weight, and thickness was 0.17mm.

[0068] The reflective mold conductivity substrate (3) was produced like the example 1 except having used this laminate. In addition, the curvature of a substrate, bending, etc. were not produced at all on the occasion of production of a reflective mold conductivity substrate (3).

[0069] When the line coefficient of thermal expansion of the reflective mold conductivity substrate (3) produced as mentioned above was measured, it turned out that they are  $1.1 \times 10^{-5}$ /degree C and a very small value.

Moreover, it is Rmax when surface roughness was measured. It was 7nm.

[0070] Moreover, as it was shown below, the transparence resin substrate (1) used as an opposite substrate of a reflective mold liquid crystal display and (2) were produced.

#### - Transparence resin substrate (1)

The polyether sulphone film with a thickness of 100 micrometers for optics marketed from the Mitsui Tonosho chemistry company was immersed during the TONEN polysilazane low-temperature baking mold N-L110 type by TONEN CORP. which is the xylene solution which contains low-temperature baking mold annular par hydronalium polysilazane by 20% of the weight of concentration, and this was dried for 30 minutes at the temperature of 80 degrees C. The barrier layer which thickness becomes from the silica which is 0.5 micrometers was formed in both sides of a polyether sulphone film by heating it at the temperature of 150 degrees C further for 2 hours, after making this polyether sulphone film immersed into hydrogen peroxide solution for 4 hours.

[0071] Furthermore, the ITO film with a thickness of 1000A was formed in one principal plane of this polyether sulphone film as a conductive layer by sputtering, and the transparence resin substrate (1) was produced.

[0072] When the line coefficient of thermal expansion of the transparence resin substrate (1) produced as mentioned above was measured, it turned out that they are  $5.5 \times 10^{-5}$ /degree C and a little big value. Moreover, it is Rmax when surface roughness was measured. It was 10nm.

#### [0073] - Transparence resin substrate (2)

To both sides of the hardening film of the thermosetting arylation polyphenylene ether with a thickness of 100 micrometers marketed from Asahi Chemical Co., Ltd., like the above-mentioned transparence resin substrate (1), the barrier layer which consists of a silica was formed, the ITO film was formed in the principal plane of one of these as a conductive layer, and the transparence resin substrate (2) was produced.

[0074] When the line coefficient of thermal expansion of the transparence resin substrate (2) produced as mentioned above was measured, it turned out that they are  $3.5 \times 10^{-5}$ /degree C and a little big value. Moreover, it is Rmax when surface roughness was measured. It was 8nm.

[0075] The above-mentioned reflective mold conductivity substrate (1) The comparison of weight and thickness was performed about alkali-free-glass substrate OA-2 [ with a thickness of 0.7mm ] marketed from - (3), a transparence resin substrate (1), (2), and Nippon Electric Glass Co., Ltd. The result is shown in Table 1.

[0076]

[Table 1]

	相対的重量	厚さ (mm)
反射型導電性基板 (1)	0.12	0.1
反射型導電性基板 (2)	0.13	0.1
反射型導電性基板 (3)	0.17	0.2
透明樹脂基板 (1)	0.08	0.1
透明樹脂基板 (2)	0.07	0.1
OA-2基板	1	0.7

[0077] In Table 1, the weight of reflective mold conductivity substrate (1) - (3) and a transparence resin substrate (1), and (2) is shown by the relative value to the weight of OA-2 substrate. The reflective mold conductivity substrates and transparence resin substrates of this invention are a light weight and a thin shape compared with a glass substrate so that clearly from Table 1.

[0078] Moreover, reflective mold conductivity substrate [ of the above-mentioned examples 1-3 ] (1) - (3), a transparence resin substrate (1), The transparence resin substrate AMOREX film with a thickness of 100 micrometers which used the polycarbonate as the base film marketed from (2) and a Fujimori industrial company, And measurement of the moisture vapor transmission under 40-degree C temperature and the humidity conditions of 60%RH and oxygen permeability was performed about transparence resin substrate FST-5337 [ with a thickness of 100 micrometers which is marketed from Sumitomo Bakelite Co., Ltd. and which used polyether sulphone as the base film ]. The result is shown in Table

2.

[0079]

[Table 2]

	水蒸気透過率 (g/m <sup>2</sup> ·day)	酸素透過率 (cc/24hr·atm·m <sup>2</sup> )
反射型導電性基板(1)	0.5	0.1以下
反射型導電性基板(2)	0.7	0.1以下
反射型導電性基板(3)	0.7	0.1以下
透明樹脂基板(1)	2.7	0.1以下
透明樹脂基板(2)	2.3	0.1以下
AMOREX	11	0.1以下
FST-5337	57	1.5

[0080] As shown in Table 2, it turns out that reflective mold conductivity substrate [ of examples 1-3 ] (1) - (3) shows good steam barrier property. Although a transparency resin substrate (1) and (2) have low steam barrier property compared with reflective mold conductivity substrate (1) - (3), they show high steam barrier property as compared with AMOREX and FST-5337.

[0081] Moreover, it turns out that reflective mold conductivity substrate (1) - (3) and a transparency resin substrate (1), and (2) show sufficient oxygen barrier property.

(Example 4) As it was shown below, the reflective mold liquid crystal display was produced.

[0082] First, patterning of the conductive layer of the reflective mold conductivity substrate (2) produced in the example 2 was carried out, and the array electrode substrate was produced. The orientation film was formed by applying the polyimide film to the electrode surface of this array electrode substrate, and performing rubbing processing.

[0083] Next, by applying the polyimide film and performing rubbing processing, the orientation film was formed in the field in which the conductive layer of the above-mentioned transparency resin substrate (2) was formed, and the common electrode substrate was formed in it.

[0084] The spacer which consists of a silica particle was sprinkled, the array electrode substrate and the common electrode substrate were stuck on it using the sealing compound which consists of an epoxy resin, as each electrode surface countered the electrode surface of the array electrode substrate formed as mentioned above, and the liquid crystal cell was produced.

[0085] After pouring in a liquid crystal ingredient from opening of this liquid crystal cell, opening was closed, the polarization film with a thickness of 0.2mm which is from polyvinyl-butylal-iodine on the screen side of a common electrode substrate was stuck, and the 5 inches

reflective mold liquid crystal display was produced.

[0086] In addition, the trouble on the process by deformation of the curvature of a reflective mold conductivity substrate, bending, etc. was not produced on the occasion of production of a reflective mold liquid crystal display. Moreover, even if it carried out the drop test of this reflective mold liquid crystal display from height of 1.5m, breakage did not produce it.

[0087] (Example 5) The 5 inches reflective mold liquid crystal display was produced like the example 4 except having formed the array electrode substrate using the reflective mold conductivity substrate produced in the example 1, and having formed the common electrode substrate using the above-mentioned transparence resin substrate.

[0088] In addition, the trouble on the process by deformation of the curvature of a reflective mold conductivity substrate, bending, etc. was not produced on the occasion of production of a reflective mold liquid crystal display. Moreover, even if it carried out the drop test of this reflective mold liquid crystal display from height of 1.5m, breakage did not produce it.

[0089] (Example 6) The 5 inches reflective mold liquid crystal display was produced like the example 4 except having formed the array electrode substrate using the reflective mold conductivity substrate produced in the example 3.

[0090] In addition, the trouble on the process by deformation of the curvature of a reflective mold conductivity substrate, bending, etc. was not produced on the occasion of production of a reflective mold liquid crystal display. Moreover, even if it carried out the drop test of this reflective mold liquid crystal display from height of 1.5m, breakage did not produce it.

[0091] (Example 7) The reflective mold liquid crystal display was produced like the example 4 except having made size into 7 inches.

[0092] In addition, the trouble on the process by deformation of the curvature of a reflective mold conductivity substrate, bending, etc. was not produced on the occasion of production of size of a reflective mold liquid crystal display as for 7 inches. Moreover, even if it dropped this reflective mold liquid crystal display from height of 1.5m, breakage did not produce it.

[0093] (Example 8) The reflective mold liquid crystal display was produced like the example 5 except having made size into 7 inches.

[0094] In addition, the trouble on the process by deformation of the curvature of a reflective mold conductivity substrate, bending, etc. was not produced on the occasion of production of size of a reflective mold

liquid crystal display as for 7 inches. Moreover, even if it dropped this reflective mold liquid crystal display from height of 1.5m, breakage did not produce it.

[0095] (Example 9) The reflective mold liquid crystal display was produced like the example 6 except having made size into 7 inches.

[0096] In addition, the trouble on the process by deformation of the curvature of a reflective mold conductivity substrate, bending, etc. was not produced on the occasion of production of size of a reflective mold liquid crystal display as for 7 inches. Moreover, even if it dropped this reflective mold liquid crystal display from height of 1.5m, breakage did not produce it.

[0097] (Example 1 of a comparison) The liquid crystal cell was produced like the example 4 except having produced the array electrode substrate and the common electrode substrate using the transparence resin substrate AMOREX film with a thickness of 100 micrometers which used the polycarbonate as the base film marketed from the Fujimori industrial company.

[0098] Next, by applying heat-resistant white coating No. 4264-2 of 1 acidity or alkalinity by OKITSUMO Co. which made silicone resin distribute a titania, and heating at the temperature of 150 degrees C for 4 hours, the rear face of the electrode surface of the array electrode substrate of this liquid crystal cell was made to harden a coating, and the reflecting layer whose thickness is 5 micrometers was formed in it.

[0099] After pouring in a liquid crystal ingredient from opening of this liquid crystal cell, opening was closed, the polarization film with a thickness of 0.2mm which is from polyvinyl-butyral-iodine on the screen side of a common electrode substrate was stuck, and the 5 inches reflective mold liquid crystal display was produced.

[0100] In addition, on the occasion of production of this reflective mold liquid crystal display, bending of a transparence resin substrate arose at the conveyance process of a substrate, at the seal process, the curvature of a transparence resin substrate arose and the positioning trouble arose. Therefore, the location precision of the produced liquid crystal cell became inadequate.

[0101] Breakage was not produced when this reflective mold liquid crystal display was dropped from height of 1.5m.

(Example 2 of a comparison) The reflective mold liquid crystal display was produced like the example 1 of a comparison except having produced the array electrode substrate and the common electrode substrate using transparence resin substrate FST-5337 [ with a thickness of 100

micrometers which is marketed and which used polyether sulphone as the base film ] from Sumitomo Bakelite Co., Ltd.

[0102] In addition, also on the occasion of production of this reflective mold liquid crystal display, bending of a transparency resin substrate arose at the conveyance process of a substrate, at the seal process, the curvature of a transparency resin substrate arose and the positioning trouble arose. Therefore, the location precision of the produced liquid crystal cell became inadequate.

[0103] Breakage was not produced when this reflective mold liquid crystal display was dropped from height of 1.5m.

(Example 3 of a comparison) The liquid crystal cell was produced like the example 4 except having produced the array electrode substrate using alkali-free-glass substrate OA-2 [ with a thickness of 0.7mm ] marketed from Nippon Electric Glass Co., Ltd., and having produced the common electrode substrate using transparency resin substrate FST-5337 [ with a thickness of 100 micrometers which is marketed from Sumitomo Bakelite Co., Ltd. and which used polyether sulphone as the base film ].

[0104] After pouring in a liquid crystal ingredient from opening of this liquid crystal cell, opening was closed and the polarization film with a thickness of 0.2mm which is from polyvinyl-butyral-iodine on the screen side of a common electrode substrate was stuck.

[0105] Next, white PET with a thickness of 200 micrometers which is marketed from Toray Industries, Inc. and which made PET distribute a titania, and E22 have been arranged as a reflecting layer at the rear face of the electrode surface of the array electrode substrate of this liquid crystal cell, and the 5 inches reflective mold liquid crystal display was produced at it.

[0106] In addition, the trouble on the process by deformation of the curvature of a reflective mold conductivity substrate, bending, etc. was not produced on the occasion of production of a reflective mold liquid crystal display. However, when this reflective mold liquid crystal display was dropped from height of 1.5m, breakage produced it in the array electrode substrate.

[0107] (Example 4 of a comparison) The reflective mold liquid crystal display was produced like the example 3 of a comparison except having produced the common electrode substrate using alkali-free-glass substrate OA-2 [ with a thickness of 0.7mm ] marketed from Nippon Electric Glass Co., Ltd.

[0108] In addition, the trouble on the process by deformation of the curvature of a reflective mold conductivity substrate, bending, etc. was not produced on the occasion of production of a reflective mold liquid

crystal display. However, when this reflective mold liquid crystal display was dropped from height of 1.5m, breakage produced it in the array electrode substrate and the common electrode substrate.

[0109] The comparison of weight and thickness was performed about the reflective mold liquid crystal display of the above-mentioned examples 4-9 and the examples 1-4 of a comparison. The result is shown in Table 3.

[0110]

[Table 3]

	相対的重量	厚さ (mm)
実施例 4	0.15	0.5
実施例 5	0.17	0.5
実施例 6	0.19	0.6
実施例 7	0.30	0.5
実施例 8	0.34	0.5
実施例 9	0.38	0.7
比較例 1	0.11	0.7
比較例 2	0.10	0.7
比較例 3	0.44	1.3
比較例 4	1	1.9

[0111] In Table 3, the weight of the reflective mold liquid crystal display of examples 4-9 and the examples 1-3 of a comparison is shown by the relative value to the weight of the reflective mold liquid crystal display of the example 4 of a comparison. Compared with the reflective mold liquid crystal display of the examples 3 and 4 of a comparison, it turns out that the reflective mold liquid crystal display of examples 1-9 is fully lightweight so that clearly from Table 3. Moreover, it turns out that the reflective mold liquid crystal display of examples 4-9 has the reflective mold liquid crystal display of the examples 1 and 2 of a comparison, an EQC, or the thickness not more than it, and it is sharply thin-shape-sized compared with the reflective mold liquid crystal display of the examples 3 and 4 of a comparison.

[0112]

[Effect of the Invention] As shown above, according to this invention, on the laminate with which a reflective mold conductivity substrate consists of a fiber cloth hardened with resin Since it is constituted by carrying out the laminating of the reflecting layer containing white pigments and resin, the barrier layer which consists of a silica, and the conductive layer one by one It has lightweight and sufficient shock resistance, oxygen barrier property, steam barrier property, and scratch-proof nature, and a configuration is easy and the manufacture approach of a heat-resistant and rigid high reflective mold conductivity

substrate, a reflective mold liquid crystal display, and a reflective mold conductivity substrate can be offered.

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[Translation done.]

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] One sectional view of the reflective mold conductivity substrate concerning 1 operation gestalt of this invention.

[Drawing 2] One sectional view of the reflective mold conductivity substrate concerning other operation gestalten of this invention.

[Drawing 3] One sectional view of the reflective mold liquid crystal display concerning 1 operation gestalt of this invention.

[Drawing 4] One sectional view of the conventional reflective mold liquid crystal display.

[Drawing 5] One sectional view of the conventional transparence resin substrate.

[Drawing 6] One sectional view of the conventional reflective mold liquid crystal display.

[Drawing 7] One sectional view of the conventional reflective mold liquid crystal display.

[Description of Notations]

11 21 -- Reflective mold conductivity substrate

12 22 -- Laminate

13, 23, 26 -- Reflecting layer

14, 24, 27 -- Barrier layer

15 25 -- Conductive layer

31 -- Reflective mold liquid crystal display

32 -- Reflective mold conductivity substrate

33 -- Transparence resin substrate

34 -- Liquid crystal layer  
41, 61, 71 -- Reflective mold liquid crystal display  
42, 43, 62, 63, 72, 73 -- Conductive substrate  
44, 64, 74 -- Liquid crystal layer  
45, 65, 75 -- Light reflex layer  
51 -- Conductive substrate  
52 -- Heat-resistant transparency resin film  
53 -- Anchor coat layer  
54 -- Transparent electrode layer  
55 -- Barrier layer  
56 -- Rebound ace court layer

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[Translation done.]

\* NOTICES \*

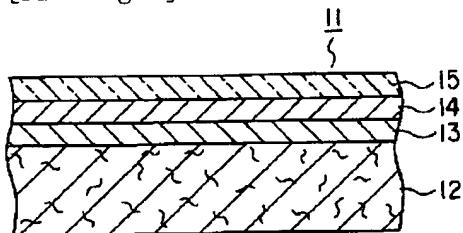
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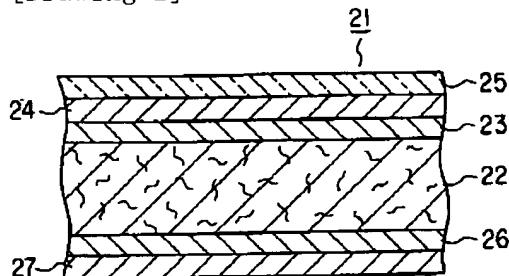
DRAWINGS

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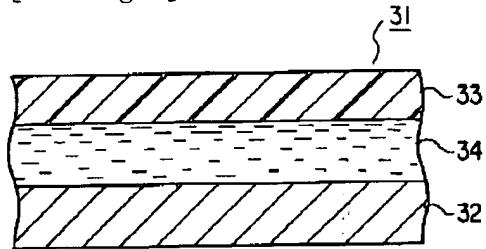
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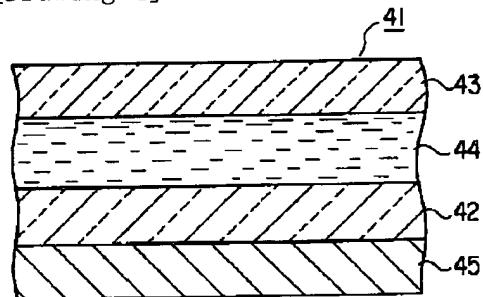
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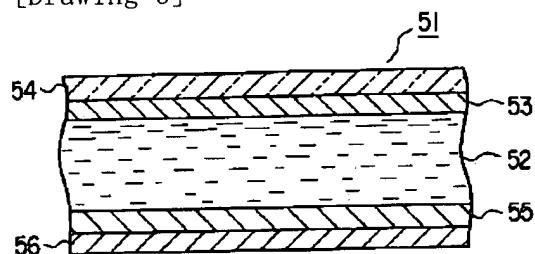
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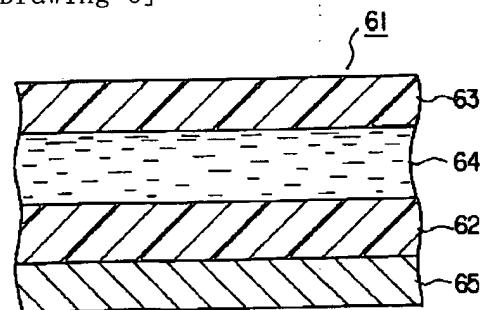
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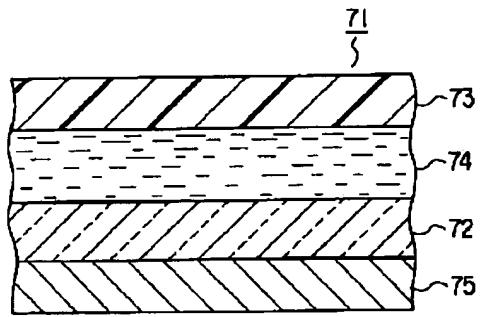
[Drawing 5]



[Drawing 6]



[Drawing 7]



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[Translation done.]